APEX: RHIC Continuous Orbit Feedback (01/27/10)

A. Marusic, R. Michnoff, M. Minty, V. Ptitsyn, G. Robert-Demolaize, T. Satogata

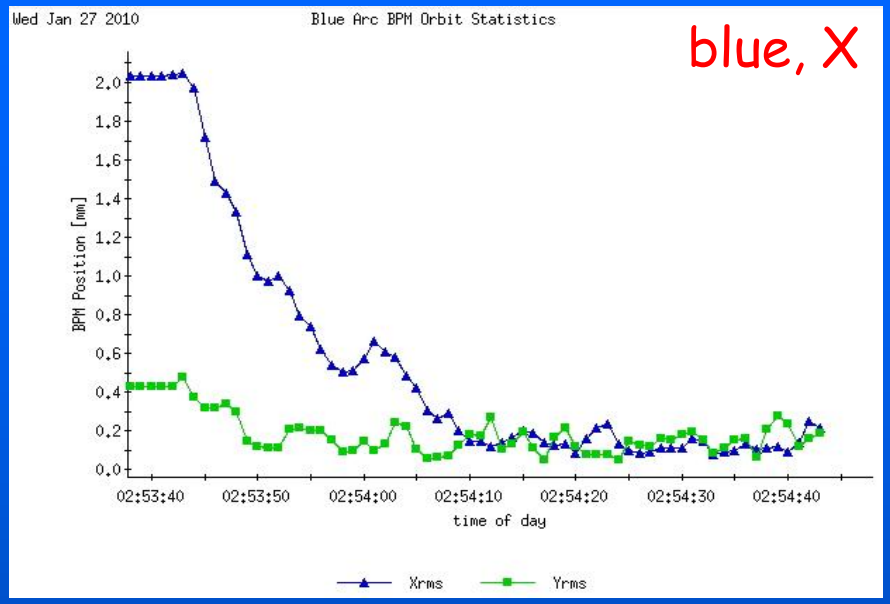
Changes since the last tests during initial beam commissioning:

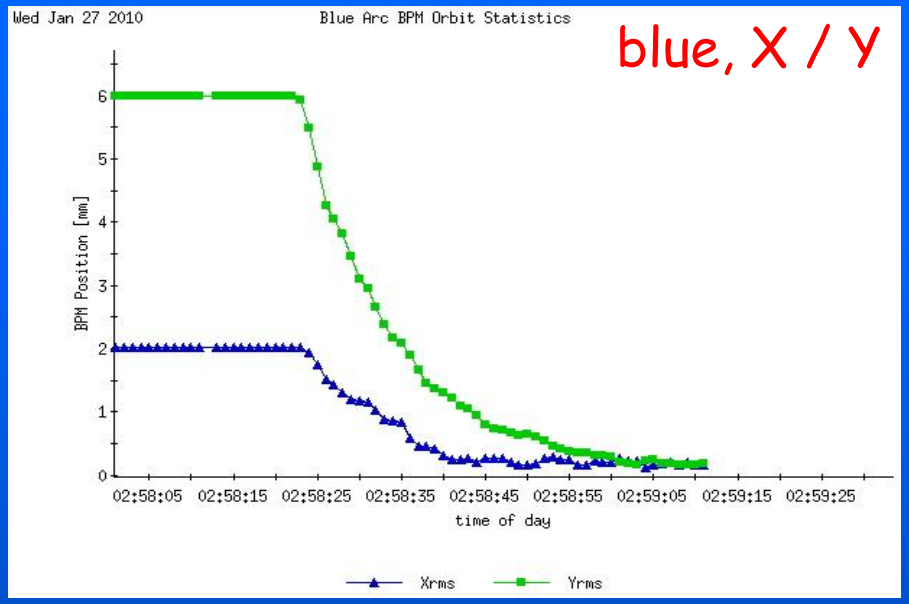
1) (BPM-based) design orbits new contain separation bumps
2) model matrices updated to Au104
3) horizontal/vertical BPM offsets changed
4) SVD tolerance cut (effective, on number of degrees of freedom) added
5) added dynamic exception handling (based on rigidity) for max corrector strengths
6) added numerous diagnostic features including a time-stamp correction which affected viewing data in BPM Orbit Statistics)

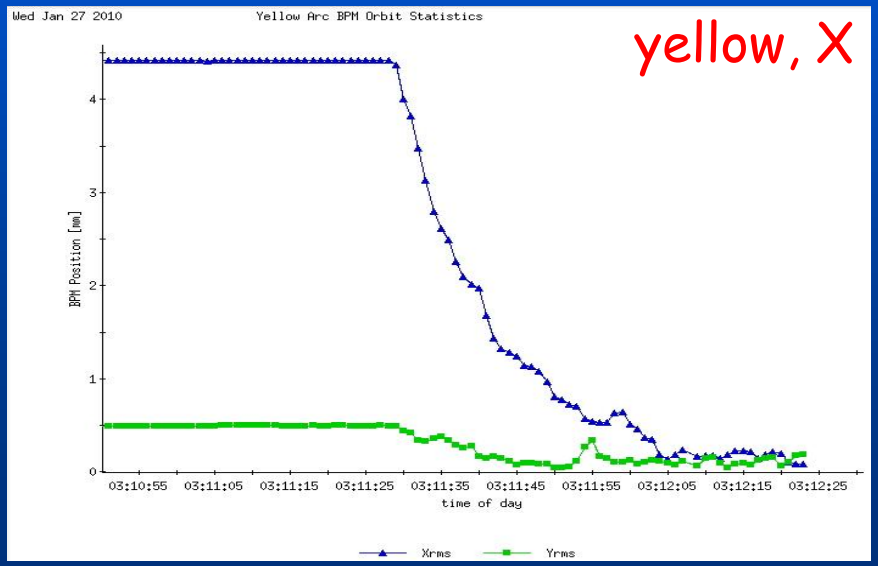
Achieved:

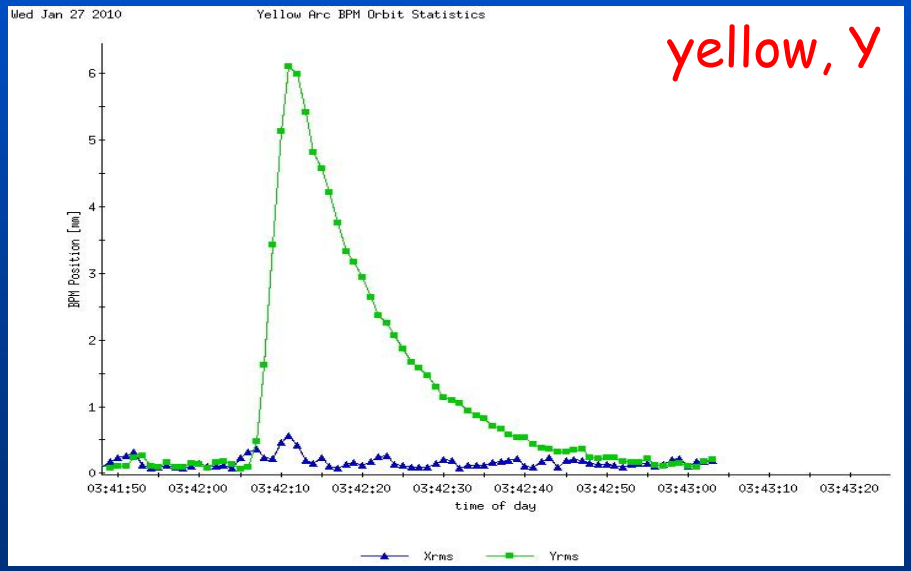
verified convergence of feedback at injection energy in all 4 planes
devoted some time to eliminating suspect BPMs – in particular discovered model/application error concerning one dual-plane in the yellow ring
executed 2 ramps with feedback on in blue and yellow and in both planes

RHIC Continuous Orbit Feedback (01/27/10) – convergence tests

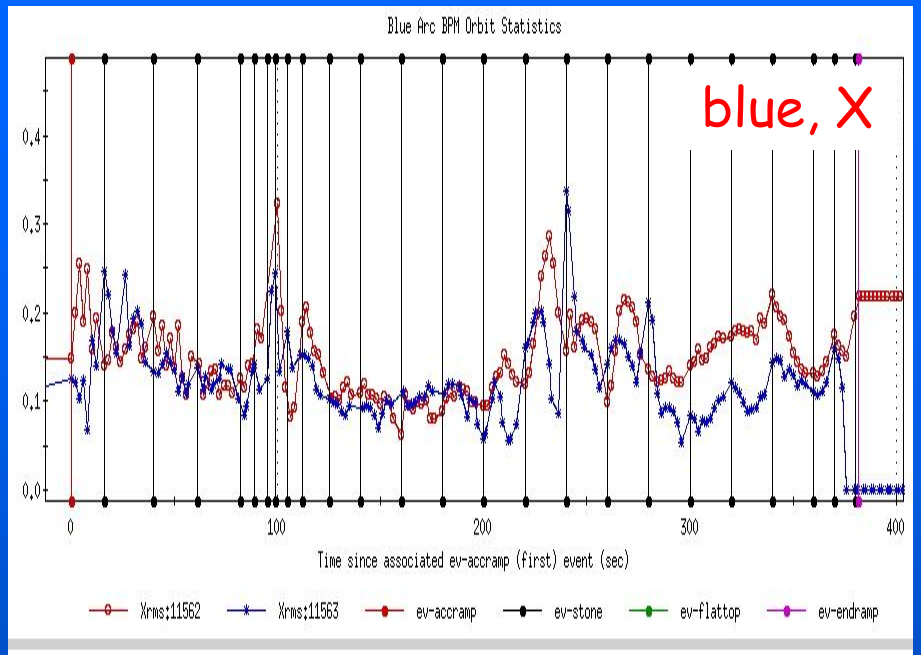


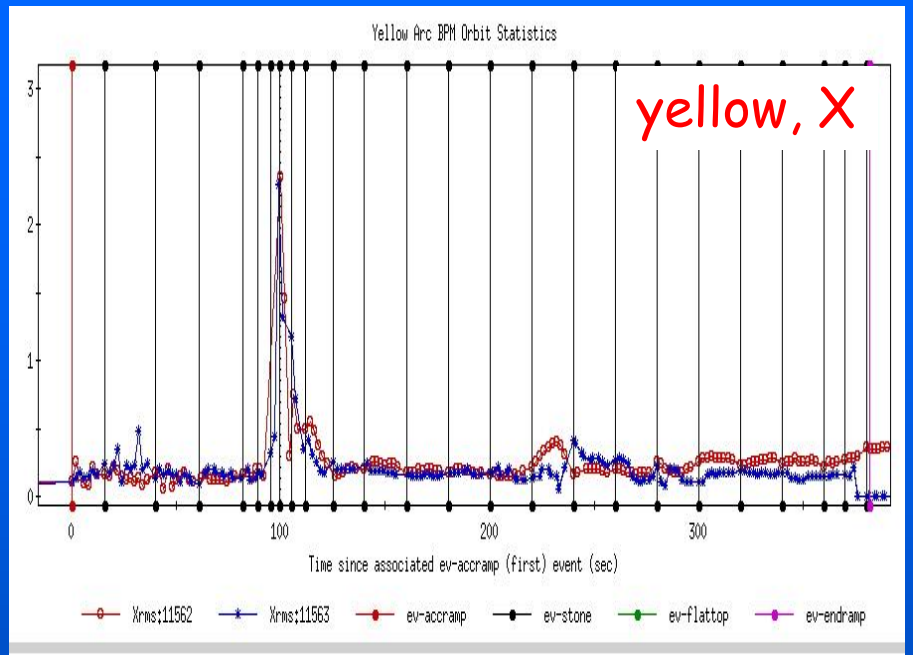


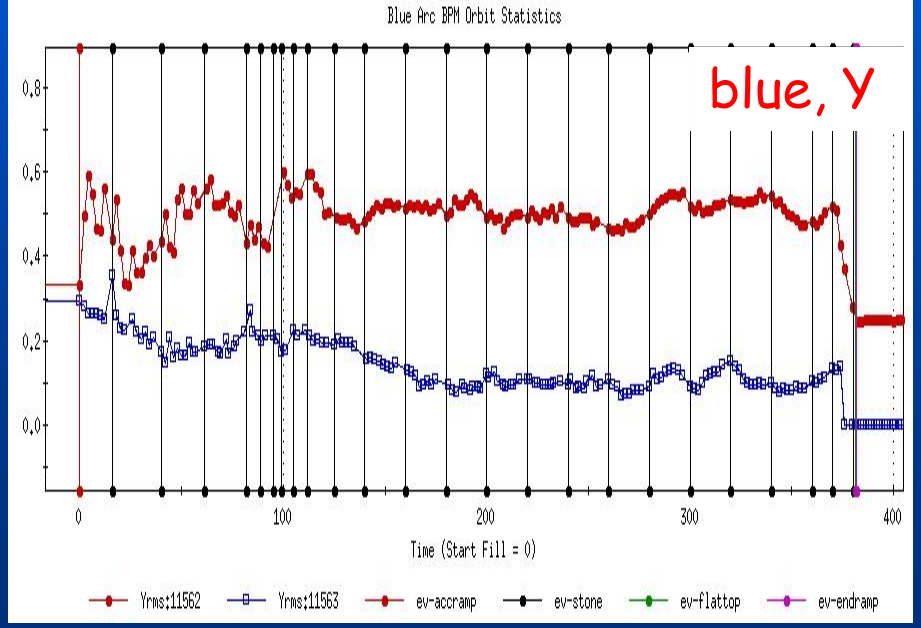


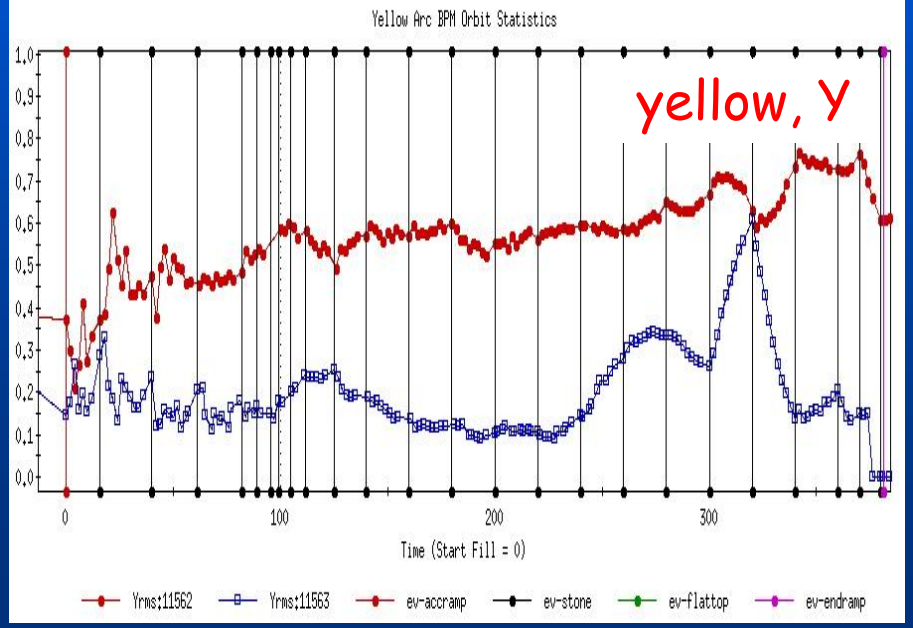


RHIC Continuous Orbit Feedback (01/27/10) – energy ramp #1

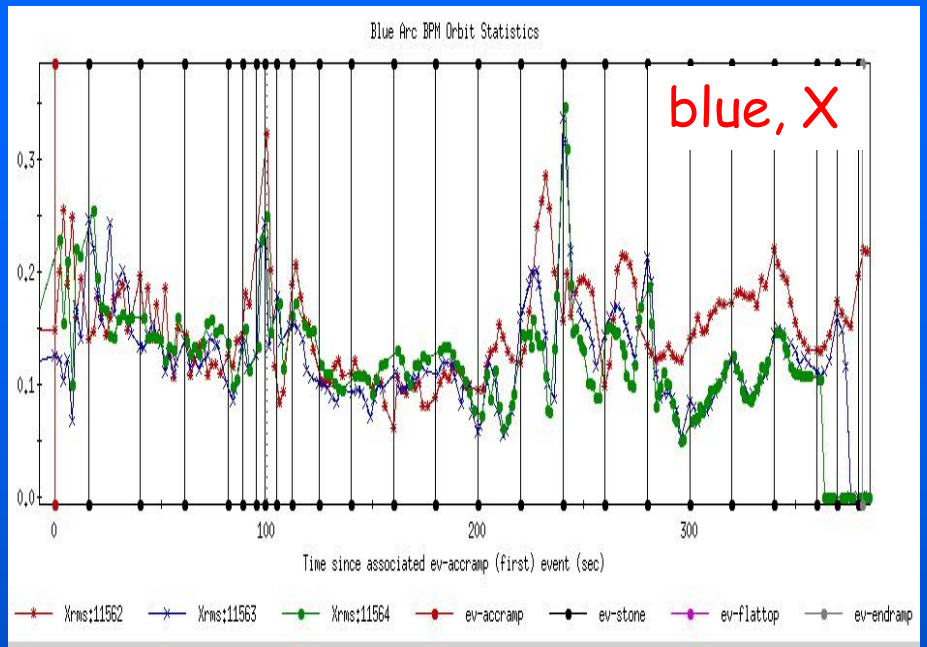


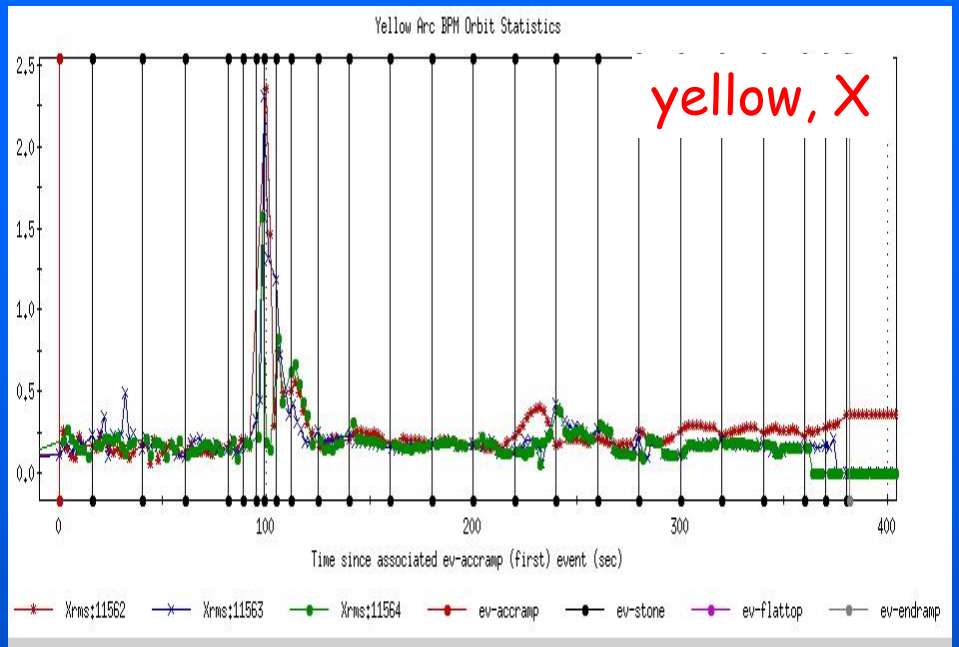


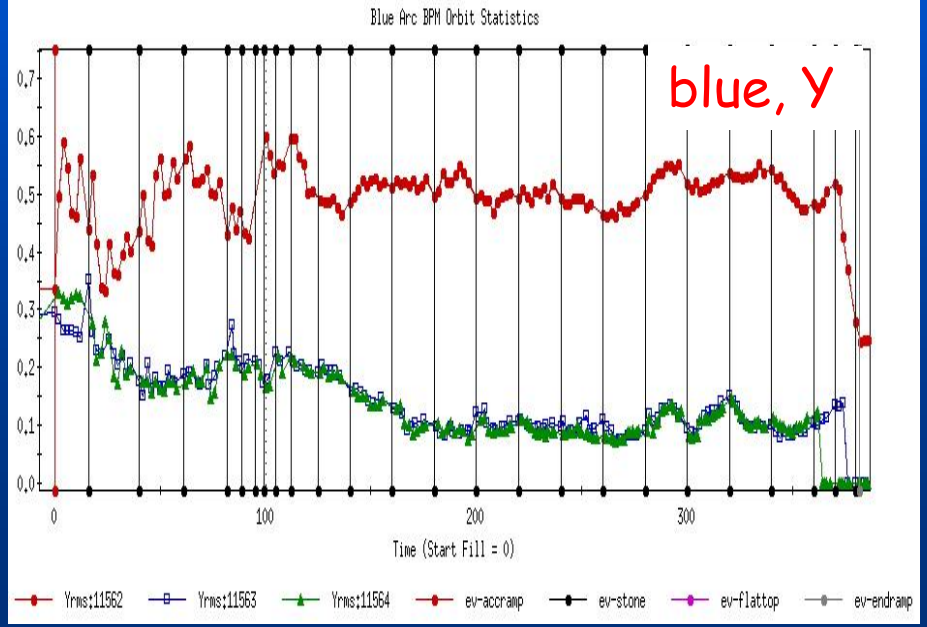


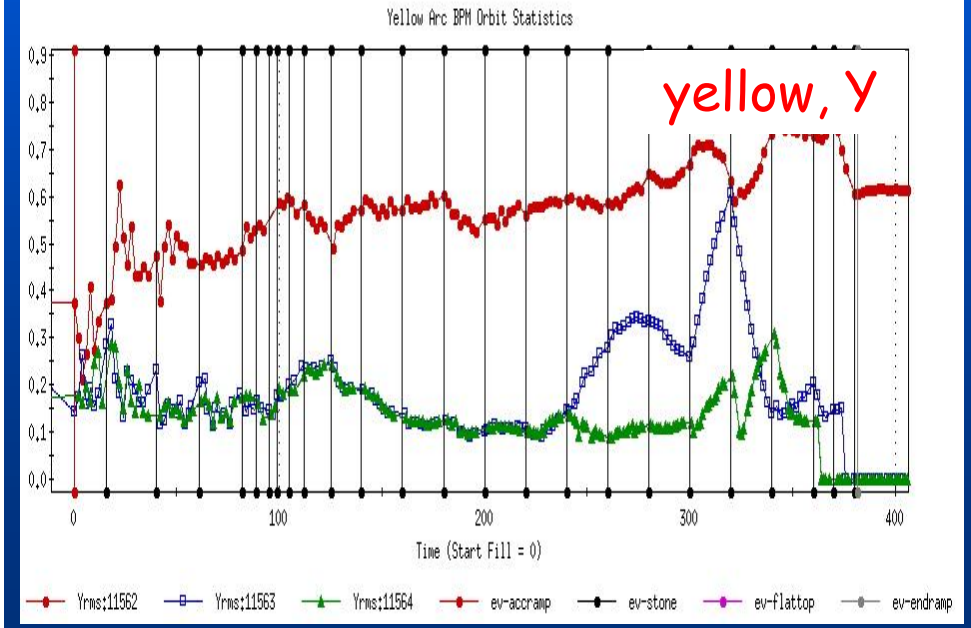


RHIC Continuous Orbit Feedback (01/27/10) – energy ramp #2c









RHIC Continuous Orbit Feedback, next APEX

request ~ 2 hours (with plans to be developed this afternoon) likely involving

1) dedicated test of horizontal feedback during energy ramp
2) ramp to store (with target orbit without separation bumps)
3) test of feedback under store conditions (fixed optics)

continuous orbit feedback meeting: Friday, 01/29/10 at 13:30 in the SCR

Minty, Michiko

Sent: Thu 1/28/2010 4:02 PM
To: Ptitsyn, Vadim; Robert-Demolaize, Guillaume; Marusic, Aljosa; Michnoff, Robert J; Satogata, Todd J
Cc: Fischer, Wolfram; Litvinenko, Vladimir; Trbojevic, Dejan; Roser, Thomas; Minty, Michiko

Message | Minutes2010January10.doc (43 KB) | Minutes2010January10.pdf (44 KB)

Greetings Everyone,

Let us meet tomorrow at 13:30 in the SCR to discuss status and plans for continuous orbit feedback.

Agenda (see also comments below):

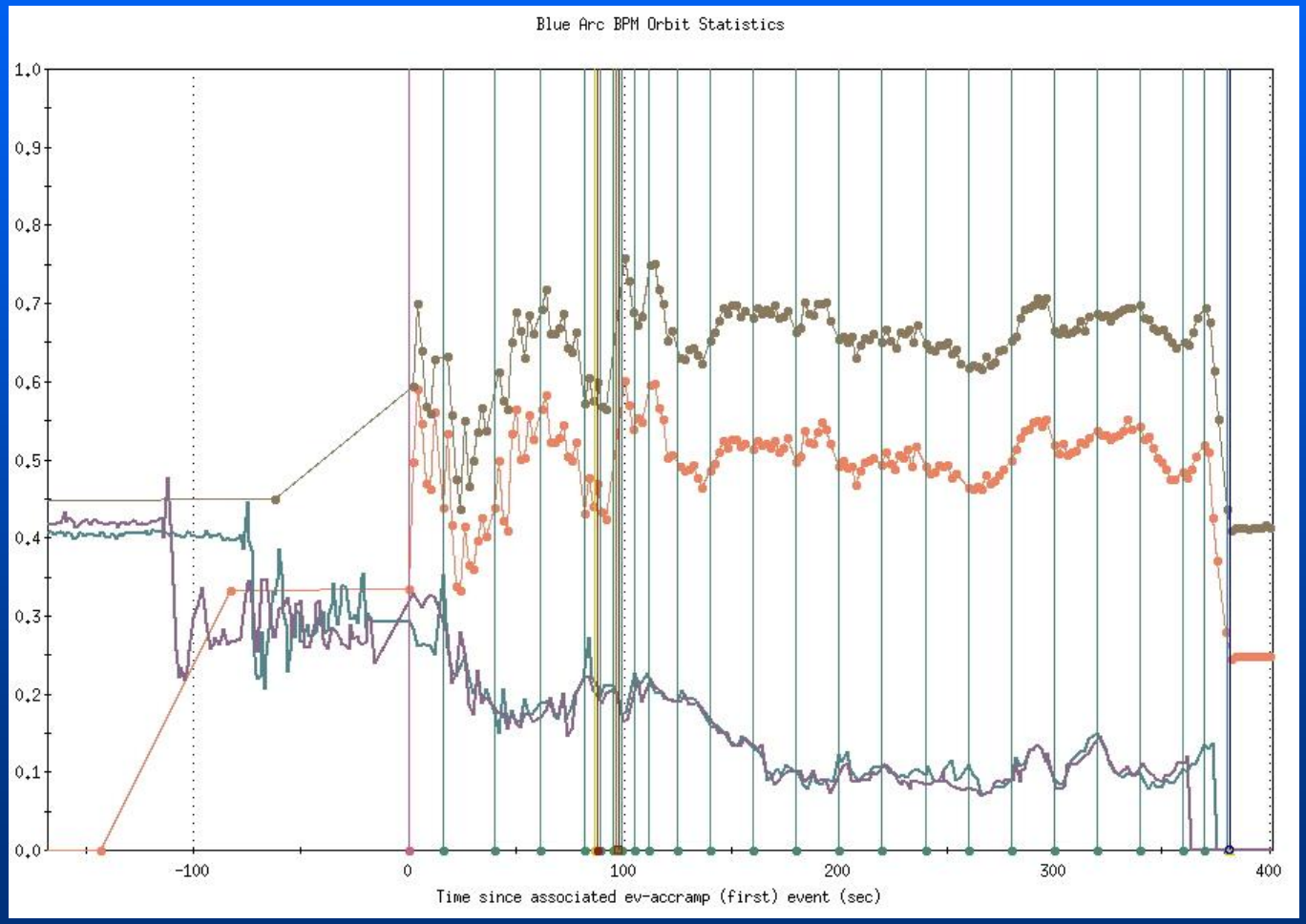
1) Status update
2) BPMs
3) Reference orbits
4) Plans for future tests
5) Plans for making operational
6) Any other business

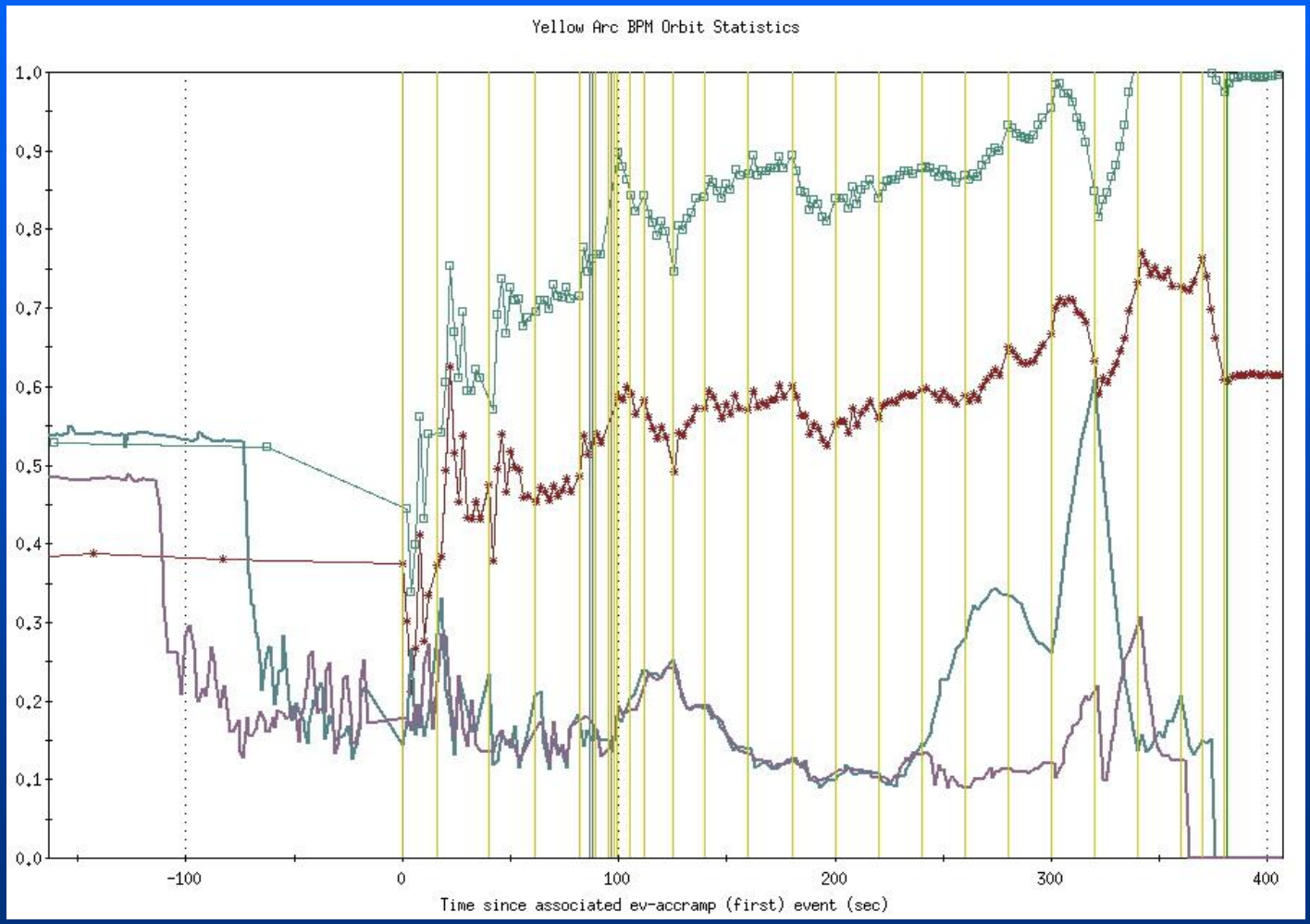
Attached please find also the minutes from our last meeting on continuous orbit feedback (01/11/10).

Thank you.

Regards, Michiko

P.S. Past meeting minutes and presentations of the past can be found at http://www.cadops.bnl.gov/Instrumentation/InstWiki/index.php/Orbit_Feedback,_Ramp


Blue Arc BPM Orbit Statistics
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-100
0
100
200
300
400
Time since associated ev-accramp (first) event (sec)


Yellow Arc BPM Orbit Statistics
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-100
0
100
200
300
400
Time since associated ev-accramp (first) event (sec)

Status: RHIC Continuous Orbit Feedback

A. Marusic, R. Michnoff, M. Minty, V. Ptitsyn, G. Robert-Demolaize, T. Satogata

since 12/01/09 presentation:

Guillaume: computation time for generation of optical matrices reduced from 20 hours to 6 hours; full set of matrices for Au101 and Au100 generated

Vadim: correction algorithm interactions (mostly) completed (including exception handling!)

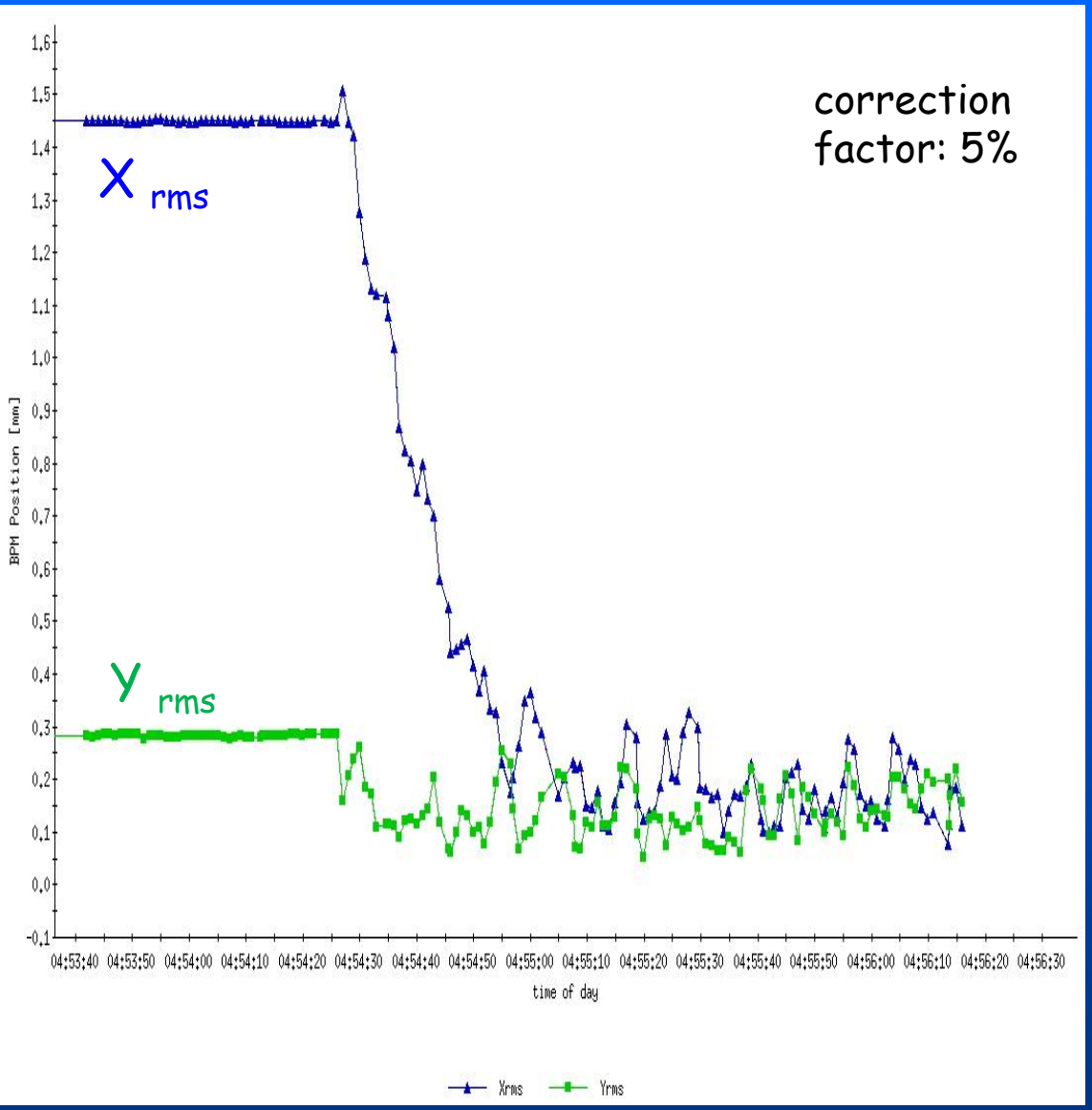
- input
  - optics – e.g. 2pi bug in OrbCorrMan.cxx
  - BPMs – renaming during shutdown, exclusion of RF and DX BPMs
- output
  - corrector strengths – e.g. number of, unit conversions

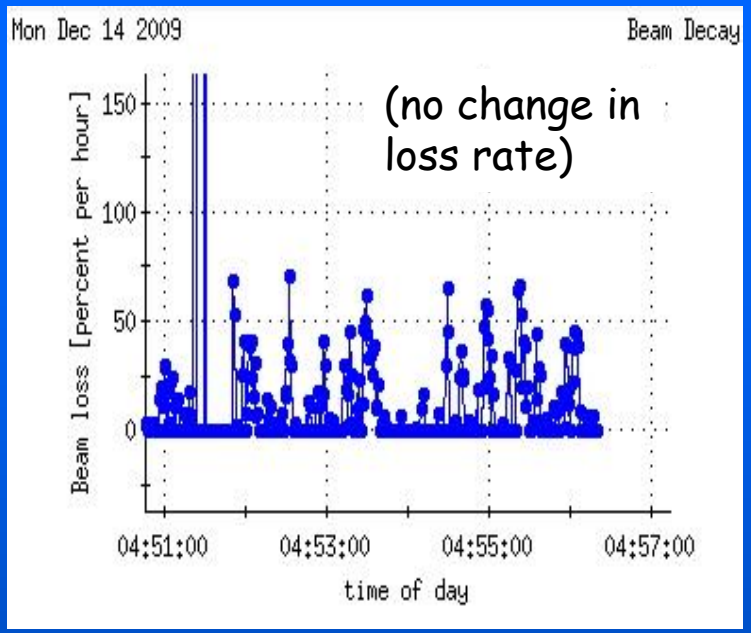
Al: OrbitFBMan (cross between WFGMan and OrbitMan and RHICOrbitDisplay) developed (enormous effort!)

WFGMan modified to program WFGs of correctors:

- WFGs: sum in corrections to linear interpolation between stones
- WFG ADOs: modified to accept corrections and deliver to WFGs at 720 Hz rate (effectively ramping in corrections)

Test results at injection energy: blue ring (12/14/09)

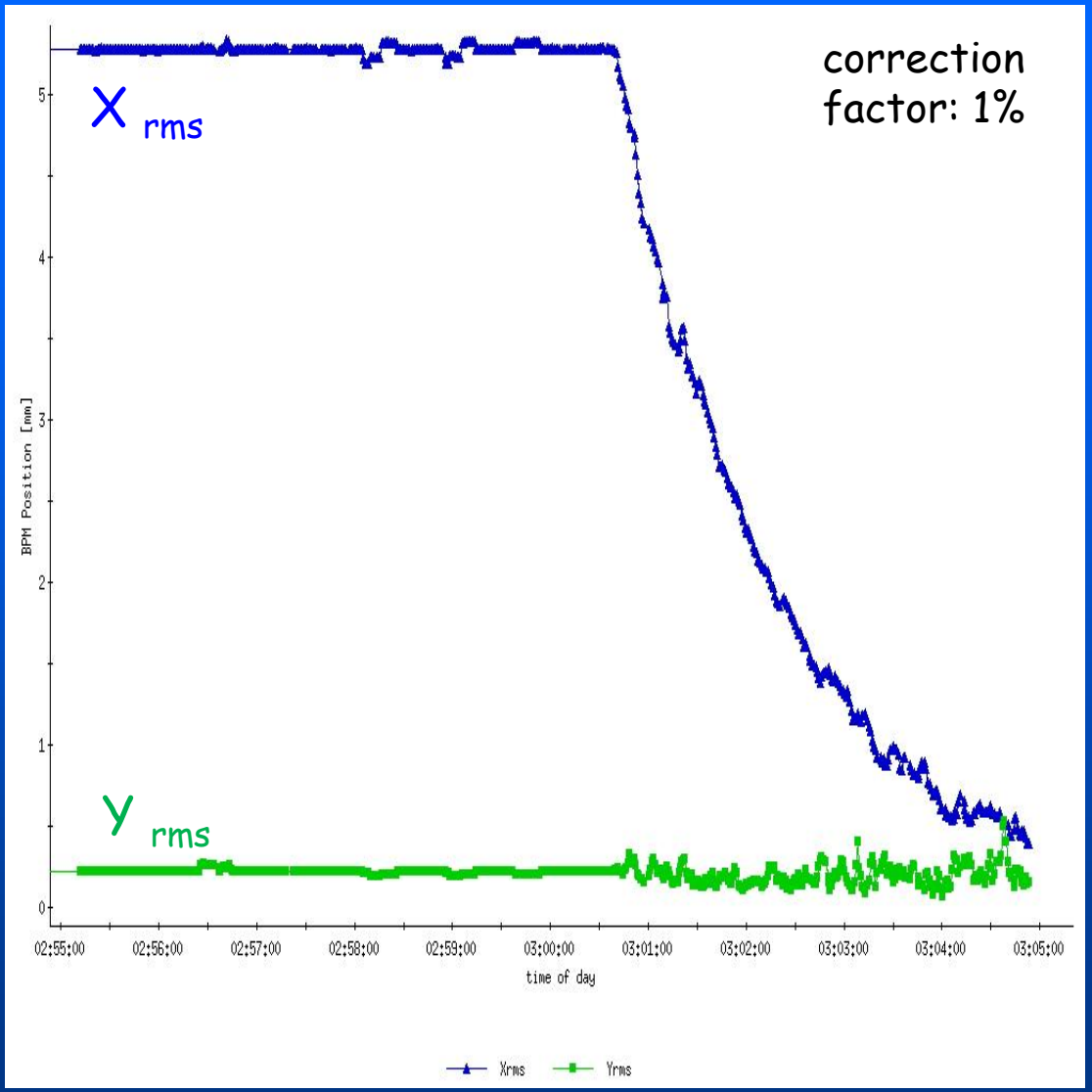


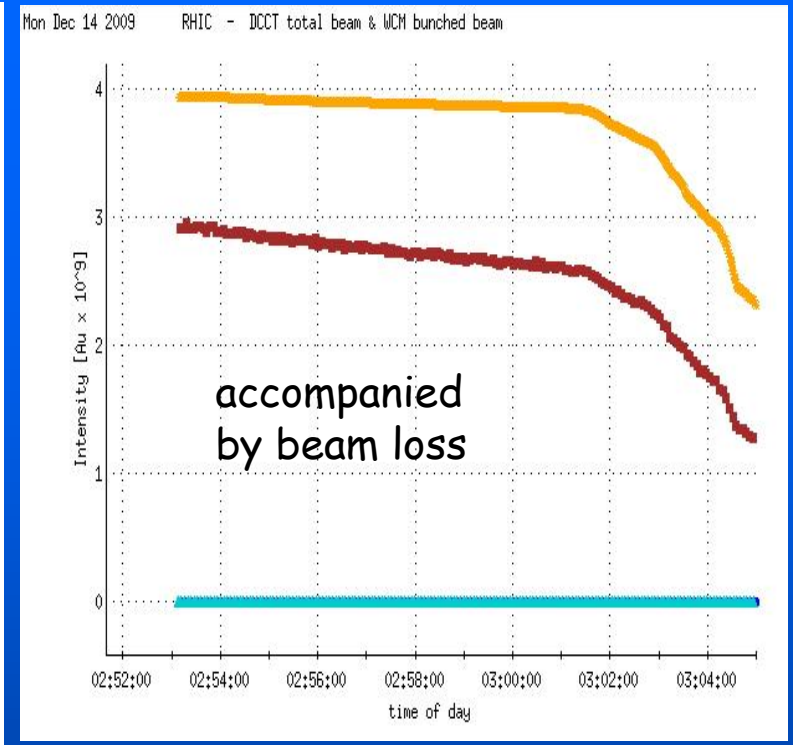


convergence to (0.2+/-0.1) mm

ready for commissioning during energy ramp (blue ring)

Test results at injection energy: yellow ring (12/14/09)



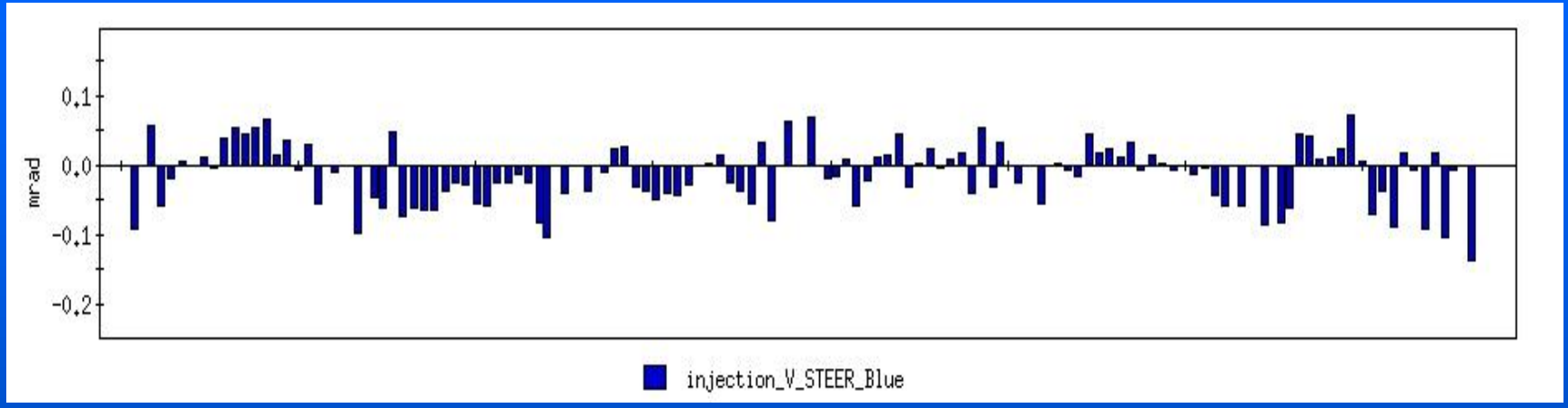


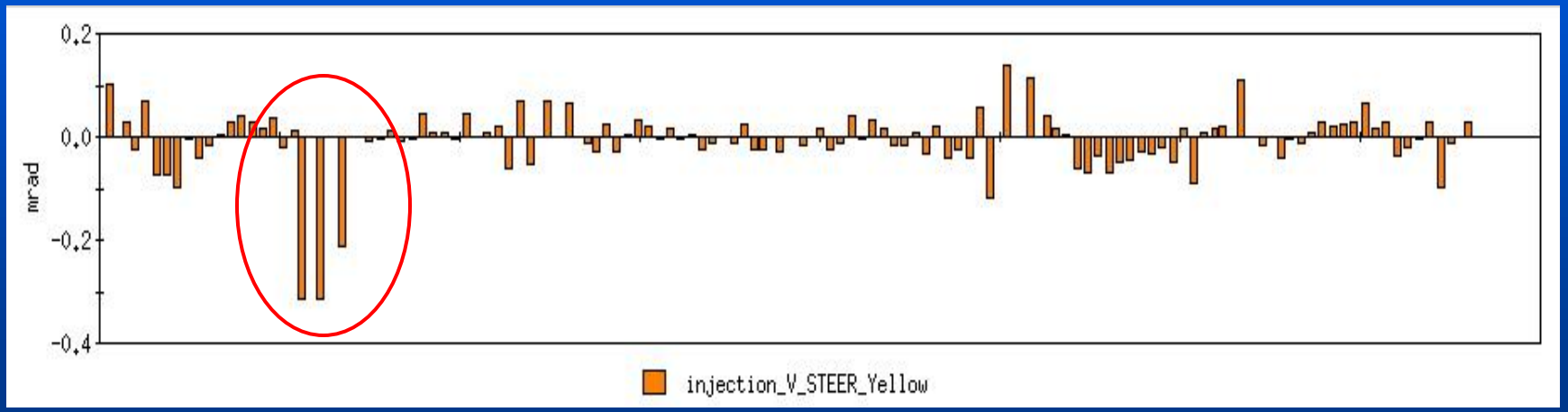
convergence to
(0.2+/-0.1) mm

Possible causes for beam loss in yellow ring:

BPM offsets

poor initial conditions (after only ~12 hours beam time)





BLUE: |xcors| < 0.2 mrad; |ycors| < 0.15

YELLOW: |xcors| < 0.2 mrad; |ycors| < 0.3

summary of measurements at injection energy

CORRECTION RATE	BLUE RING	YELLOW RING
1%	(not measured)	250 s
5%	30 s	50 s
10%	15 s	25 s
BEAM LOSS?	NO	YES

Next steps:

commission orbit feedback during ramp in blue
continue tests at injection in yellow (with better boundary conditions)
lots of additional code work:
    develop capability for feed-forward of corrections
    nonzero design orbits, …
performance analyses (e.g. understand achieved rms values and limitations)